

# **Characterization of Mercury Emissions at a Chlor-Alkali Plant**

## **VOLUME I Report and Appendices A-E**

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## **ABSTRACT**

Current estimates indicate that up to 160 short tons (146 Mg) of mercury (Hg) is consumed by the chlor-alkali industry each year. Very little quantitative information is currently available, however, on the actual Hg losses from these facilities. The Hg cell building roof vent is considered to be the most significant potential emission point in chlor-alkali plants, especially when the cells are opened for maintenance. Because of their potential importance, chlor-alkali plants have been identified as needing more accurate measurements of Hg emissions. To obtain a better understanding of the fate of Hg within their manufacturing process, the Olin Corporation voluntarily agreed to cooperate with the U.S. Environmental Protection Agency in a comprehensive study of the Hg emissions from their Augusta, GA, facility, in collaboration with other members of the Chlorine Institute representing the active chlor-alkali plants in the United States.

To investigate the Hg releases from the Olin chlor-alkali facility, the EPA's National Risk Management Research Laboratory, Air Pollution Prevention and Control Division (EPA-APPD) in Research Triangle Park, NC, organized a special study involving multiple organizations and personnel. However, only the research conducted by EPA-APPD involving roof vent monitoring and air flow studies conducted in the Olin cell building is discussed in this report.

The overall objective of monitoring the cell building roof vent was to determine the total elemental mercury ( $\text{Hg}^0$ ) mass flux from the cell building under a range of typical wintertime meteorological conditions, including both normal operation of the cell building and routine maintenance of Hg cells and decomposers. Secondary objectives of the research were to perform an air flow mass balance for the building and to compare various Hg monitoring methods under a variety of sampling conditions. Both objectives were met during the February 2000 field sampling campaign, which showed an average  $\text{Hg}^0$  emission rate of 0.36 g/min from the roof ventilator as determined over the 9-day monitoring period.

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## LIST OF ABBREVIATIONS AND SYMBOLS

APPCD	Air Pollution Prevention and Control Division
ATREEs	anemometer trees
CAPs	Chlor-alkali plants
CH <sub>4</sub>	methane
Cl <sub>2</sub>	chlorine gas
CO	carbon monoxide
CVAFS	cold-vapor atomic fluorescence spectrometer
DAS	data acquisition system
DMB	direct mass balance
DOAS	differential optical absorption spectrometer
DQI	data quality indicator
EPA	U.S. Environmental Protection Agency
ERG	Eastern Research Group, Inc.
FTIR	Fourier transform infrared spectrometer
H <sub>2</sub>	hydrogen
HCl	hydrogen chloride
Hg	mercury
Hg <sup>0</sup>	elemental mercury
LIDAR	Light Detection and Ranging
LOA	Scientific Technology Model LOA-104 optical anemometer
LRPCD	Land Remediation and Pollution Control Division
N <sub>2</sub> O	nitrous oxide

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## **LIST OF ABBREVIATIONS AND SYMBOLS (Continued)**

NaCl	sodium chloride
NaOH	sodium hydroxide
NERL	National Exposure Research Laboratory
NIST	National Institute for Standards and Technology
NWS	National Weather Service
OECA	Office of Enforcement and Compliance Assurance
ORNL	Oak Ridge National Laboratory
OxyChem	Occidental Chemical Corporation
PI	Principal Investigator
QAPjP	Quality Assurance Project Plan
QC	quality control
SOP	Standard Operating Procedure
SF <sub>6</sub>	sulfur hexafluoride
UM	University of Michigan
UV-DOAS	ultraviolet differential optical absorption spectrometer

## UNIT CONVERSION TABLE

<b>Multiply</b>	<b>By</b>	<b>To Obtain</b>
atm	29.92	in. Hg
atm	760	mm Hg
ft	0.3048	m
km	0.6214	mi
L/day	0.264	gal./day
m <sup>3</sup> /min	35.31	ft <sup>3</sup> /min
pounds	453.6	g
short ton	0.91	metric ton
temperature (°C + 17.8)	1.8	temperature (°F)

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